ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

INTEGRATED MONITORING PLAN FY05

SUMMARY DOCUMENT

Responsible Organization: ENVIRONMENTAL SYSTEMS & STEWARDSHIP

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ACRONYMS AND ABBREVIATIONS

ALARA	As low as reasonably achievable
ALF	Action Levels and Standards Framework
AOC	Area of concern
AoI	Analyte of interest
AQM	Air Quality Management
BDCWA	Big Dry Creek Watershed Association
BMP	Best management practice
CAA	Clean Air Act
CAD	Corrective Action Decision
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
ComRad	Community Radiation
CWA	Clean Water Act
DOE	US Department of Energy
DRCOG	Denver Regional Council of Governments
DQO	Data quality objective
EDE	Effective dose equivalent
EPA	US Environmental Protection Agency

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ER	Environmental restoration
ESS	Environmental Systems and Stewardship
FY	Fiscal year
IM/IRA	Interim Measures/Interim Remedial Actions
IMP	*Integrated Monitoring Plan*
Kaiser-Hill	Kaiser-Hill Company LLC
L	Liter
LM	DOE Legacy Management
MOU	Memorandum of Understanding
mrem	millirem
NA	Not applicable
NPDES	National Pollutant Discharge Elimination System
NREL	National Renewable Energy Laboratory
OU	Operable Unit
POC	Point of Compliance
POE	Point of Evaluation
QA/QC	Quality assurance/quality control
RAAMP	Radioactive Ambient Air Monitoring Program
Rad-NESHAP	"National Emission Standards for Emissions of Radionuclides other Than Radon from Department of Energy Facilities" (40 CFR 61, Subpart H)
RCRA	Resource Conservation and Recovery Act
RFCA	*Rocky Flats Cleanup Agreement*
RFETS	Rocky Flats Environmental Technology Site
RFPO	Rocky Flats Project Office
RMRS	Rocky Mountain Remediation Services
ROD	Record of Decision
SSC	Species of special concern
Site	Rocky Flats Environmental Technology Site
SWPRG	Surface Water Preliminary Remediation Goals
T&E	Threatened and Endangered (Species)
TSS	Total suspended solids
USFWS	US Fish and Wildlife Service
VOC	Volatile organic compound
WARP	Well Abandonment and Replacement Program
WRW	Wildlife Refuge Worker
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

Environmental monitoring programs at the Rocky Flats Environmental Technology Site (RFETS or Site) continue to evolve in response to new regulatory requirements and accelerated Site closure activities. Monitoring programs have amassed data on soils, surface water, groundwater, air, and various ecological systems. The *Rocky Flats Cleanup Agreement* (RFCA) (US Department of Energy [DOE], Colorado Department of Public Health and Environment [CDPHE], and US Environmental Protection Agency [EPA], 1996) requires DOE, in consultation with CDPHE, and EPA, to establish an integrated monitoring program that effectively collects and reports the data required to ensure the protection of human health and the environment. The program is consistent with the RFCA Preamble, and it complies with RFCA, laws and regulations, and effective management of RFETS resources.

This fiscal year 2005 (FY05) *Integrated Monitoring Plan Summary Document* (IMP) identifies routine monitoring programs for surface water, groundwater, air, and ecology, and associated data management systems, that are designed to minimize duplication of effort among DOE, CDPHE, EPA, and the cities of Broomfield and Westminster.

The IMP details RFETS monitoring activities performed for legal, contractual, and operational purposes. It restates the agreed upon types of monitoring, monitoring locations, sampling frequencies, and purposes of the monitoring. Much of the monitoring discussed in this document is performed to satisfy specific regulatory requirements that are not due to the RFCA agreement. Where this is the case, such monitoring requirements are not subject to enforcement pursuant to RFCA, but may be subject to enforcement in accordance with the initiating legal requirements. In addition, RFETS monitoring programs encompass best management practices (BMPs) that are not required by RFCA or other federal and state laws and regulations. The BMPs are incorporated into the IMP, but may be dependent on the availability of federal funding in accordance with RFCA, Paragraph 249.

In developing the IMP, RFETS personnel met with a working group of representatives from EPA; the State of Colorado; and the cities of Westminster, Northglenn, Thornton, Arvada, and Broomfield to develop consensus on the types of data to be gathered and their eventual uses as portrayed in the data quality objectives (DQOs) described in this IMP. The program is designed to provide data that meet the DQOs needed to support operational and regulatory decision making, and to address the requirements of the following statutes, regulations, permits, and agreements:

- Resource Conservation and Recovery Act (RCRA);
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA);
- Clean Air Act (CAA);
- Clean Water Act (CWA);
- National Pollutant Discharge Elimination Systems (NPDES) permit and amendments;
- Colorado Hazardous Waste Acts;

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- Standards promulgated by the Colorado Water Quality Control Commission;
- RFCA;
- Regulations governing natural resource (ecological) management;
- RFETS-specific monitoring and cleanup agreements; and
- DOE Orders and technical guidance.

1.1 INTEGRATED MONITORING PLAN

This document, the FY05 IMP, is a revision of the FY04 IMP (Kaiser-Hill Company, LLC [Kaiser-Hill], 2004a) and the FY04 *IMP Background Document* (Kaiser-Hill, 2004b), which describe the activities being conducted at RFETS under the IMP to satisfy RFCA and other regulatory requirements and interests. The FY05 *IMP Background Document* provides detailed discussions of the decision-making process that has resulted in numerous monitoring efforts at RFETS. This FY05 IMP lists the monitoring programs to which DOE and the other regulatory agencies are committed. The FY05 *IMP Background Document* provides additional information about the DQO decision process and the regulatory framework that drives many of the monitoring decisions at RFETS. The FY05 *IMP Background Document* is not subject to enforcement under RFCA.

This FY05 IMP lists the ongoing environmental monitoring activities that DOE, CDPHE, EPA, and other stakeholders have supported during the numerous working group meetings used to formulate monitoring-based decisions. It provides an overview of the requirements for these activities and the intended uses of the data that result. Monitoring is performed in four primary areas—surface water, groundwater, air, and ecological systems. Specific RFETS activities may involve soil monitoring, although RFETS-wide soil monitoring was discontinued in 1994 after many years of characterizing transuranic-contaminant distributions across RFETS. Currently, soil monitoring is performed on a project-specific basis. Soil data relate to other media in various ways and continue to be important to the other programs, to future projects and project planning, and ultimately to Site closure. Interactions among these media have been recognized and discussed in some detail in the FY05 *IMP Background Document*. The data collected can be used to support investigations into these interactions to the extent that the interactive effects are themselves measurable.

Each of the four major monitoring programs is discussed in this summary document. A discussion of RFETS soil monitoring is included in Section 6.0, and interactions between media are included in Section 7.0, of the FY05 *IMP Background Document*.

1.2 DATA QUALITY OBJECTIVES

Representatives of DOE, Rocky Flats Project Office (RFPO); Kaiser-Hill; and the various federal, State of Colorado, and local stakeholder groups together developed a set of DQOs to ensure that environmental monitoring data would satisfy the requirements of the regulations listed above and would aid in detection of conditions that could lead to unacceptable risks to public health and the environment. The data will be used to: 1) measure or model contaminant movement and identify contaminant concentrations that exceed pre-established limits; 2) address regulatory reporting requirements and commitments; 3) monitor various ecological systems at

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RFETS; and 4) support planning, implementation, and assessment of remedial, and decontamination and decommissioning, activities.

Therefore, the data need to meet or exceed quality requirements to ensure accuracy in modeling, risk assessment, performance assessment, and compliance. The data must be of sufficient quality to withstand scientific and legal scrutiny, and must be gathered using appropriate procedures for their intended use in making decisions for RFETS activities. Each environmental monitoring program includes a set of data usability requirements and procedures to ensure that high-quality data are produced.

1.3 QUALITY ASSURANCE

The quality of the RFETS environmental monitoring data is ensured through careful planning and design of monitoring programs and implementation of work control procedures that address sampling, analysis, and data management activities. Presented in this document are statements of the major decisions that need to be made based on monitoring data, how the data will be applied in decision making, and the approaches used to obtain the data. Procedures cover monitoring activities, including sampling, analysis, and data management, and consist of approved, controlled documentation. Monitoring procedures are referenced in the various environmental program plans (available at *http://rfets/environmental/Library/Guidance/EMPG/*).

RFETS environmental program and analytical services managers have a significant role in controlling the quality of environmental monitoring data. They are responsible for designing adequate environmental monitoring programs, collecting environmental samples and field data of high quality, properly submitting samples, ensuring data are managed per procedures, and interpreting and reporting monitoring results.

Minimum requirements for laboratory quality assurance/quality control (QA/QC) programs have been promulgated. These requirements ensure that each laboratory generating data has procedures for assuring that the precision, accuracy, completeness, and representativeness of data generated are known and documented.

Additionally, analytical data are subject to data assessment (quality assurance evaluation of analytical chemistry data). Assessments cover monitoring activities, including sampling and analysis. Subcontracted laboratories are routinely audited and participate in inter-laboratory cross-check programs. Assessments are conducted in compliance with DOE Order 414.1B (*Quality Assurance*) and the Kaiser-Hill Team Quality Assurance program. Assessment findings are tracked and corrected pursuant to the Kaiser-Hill *Corrective Action Process* (3-X31-CAP-001). The FY05 *IMP Background Document* details the overall QA/QC requirements, including field duplicate and blank samples, analytical detection limits, and standards for accuracy and completeness.

1.4 FUTURE OF THE INTEGRATED MONITORING PLAN

Following completion of the cleanup and closure of RFETS, DOE's Office of Environmental Management, which is responsible for the cleanup, will transfer management of the lands that DOE retains to DOE's Office of Legacy Management (LM). LM was established in December 2003 to conduct long-term management activities for DOE sites that no longer support DOE's ongoing missions, including disposal sites and other remediated sites such as RFETS. At

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RFETS, LM will also be responsible for compliance with long-term requirements outlined in the Site's Corrective Action Decision/Record of Decision (CAD/ROD) and implemented through the post-closure RFCA.

Under this IMP, work is now performed for DOE's Office of Environmental Management through subcontractors performing under the Kaiser-Hill contract. The scope of work that is transitioned to LM will be performed by its subcontractors under similar authority. Those subcontractors and their organization are not currently identified in the IMP.

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2.0 SURFACE-WATER MONITORING

2.1 INTRODUCTION

The surface-water monitoring program at RFETS addresses the requirements of statutes, regulations, orders, and agreements, and supports many decision-making processes. Surface-water monitoring (summarized in Table 1) encompasses five areas:

- RFETS-wide water quality;
- Quality of waters within the Industrial Area;
- Quality of discharges from the Industrial Area;
- Quality of water leaving RFETS; and
- Off-Site water quality.

Protocols for sampling and analysis of surface water, as well as QA/QC requirements, are defined in several documents. Refer to Section 2.1.5 of the FY05 *IMP Background Document* for details.

RFETS maintains surface-water data in the Rocky Flats Soil and Water Database (formerly the Rocky Flats Environmental Database System). The data can be retrieved and reported in many formats for specific purposes. Many of the data generated are not specifically reported in RFETS documentation, but are provided to requestors or decision makers as needed. However, regularly generated reports include:

- NPDES permit compliance reports, including monthly and annual preparation and delivery of a Discharge Monitoring Report to EPA Region VIII;
- Pre-discharge and community assurance monitoring results gathered by the State, and reported routinely to RFETS and nearby cities;
- Reportable RFCA monitoring results (those above RFCA standards and action levels) reported to EPA and CDPHE;
- The bulk of the surface-water data collected are summarized and reported at Quarterly Information Exchange Meetings, which have been held since 1972; and
- Annual Automated Surface Water Monitoring Reports, including all required data summaries and evaluations.

2.2 SITE-WIDE WATER QUALITY

This section deals with surface-water monitoring objectives that are not confined to a particular part of RFETS. Site-wide monitoring includes:

- Monitoring the dams that form the RFETS detention ponds (dams lie within a defined area, but monitoring is performed to ensure their integrity and safety);

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Table 1. Surface-Water Monitoring Matrix

Type of Monitoring	Locations	Sampling Frequency	Sampling Performed By	Purpose
SITE-WIDE				
Dam Operations–Imminent Danger to Life and Health	Detention ponds	Various regular intervals	Site personnel	Assess need for discharges from ponds to ensure dam integrity
Streamflow	7 stream locations	Continuous when flowing	Site personnel	Determine streamflow upgradient of Ponds A-3, A-4, B-5, and C-2. Determine outflow from Ponds A-3, A-4, B-5, and C-2
Pond Elevations	5 pond locations	Daily (hourly if needed)	Site personnel	Monitor amount of water detained in Ponds A-3, A-4, B-5, and C-2
Piezometers	Dams at Ponds A-3, A-4, B-1, B-3, B-4, B-5, C-2, and Landfill Pond	Continuous	Site personnel	Monitor level of saturated zone in detention structures
Dam Integrity Inspections	12 dams	Various	Site, DOE, and Federal Energy Regulatory Commission personnel	Assess physical integrity of earthen dams
Ad Hoc	Varies	As needed[a]	Site personnel	Address need for special monitoring
Source-Location	Varies	As needed[a]	Site personnel	Identify sources of new contamination detected by the surface-water monitoring program
Indicator Parameter	Varies	As needed[a]	Site personnel	Evaluation of analytical results using field measured indicator parameters
INDUSTRIAL AREA				
New Source Detection	5 locations	As needed[a]	Site personnel	Detect changes in analyte of interest concentrations or water-quality parameters that might indicate new contamination

Table 1. Continued

Type of Monitoring	Locations	Sampling Frequency	Sampling Performed By	Purpose
Incidental Waters and Contaminated Non-Stormwaters	Varies	As needed[a] (approximately 100 events per year on average)	Site personnel	Determine acceptable disposal method per NPDES permit
Performance Monitoring	Varies	As needed[a], generally from 18 months before project start-up to 3 months after completion	Site personnel	Establish baseline conditions and monitor effects of RFETS activities on water quality
INDUSTRIAL AREA DISCHARGES TO PONDS				
Stream Segment 5	3 Action Levels and Standards Framework locations	Varies[a] (total approximately 87 samples)	Site personnel	Monitor compliance with RFCA action levels
WATER LEAVING THE SITE				
Predischarge	Ponds A-4, B-5, and C-2	About 8-10 events per year (1 event per year at C-2)	Site personnel (CDPHE analyzes samples)	Determine quality of water and safety of discharges from terminal ponds
Terminal Ponds	3 terminal ponds	Frequency specified in *IMP Background Document*	Site personnel	Verify that pond discharges do not adversely affect downstream water quality
Segment 4	5 locations	About 3 samples for each of 8-10 discharge events, plus 1-4 samples per month between discharges[a]	Site personnel	POC monitoring
Non-POC at Indiana Street	Walnut Creek & Woman Creek Drainages	Total of 8 samples annually	CDPHE	Assess effects of flow changes on nutrient loads in water leaving RFETS

Table 1. Continued

Type of Monitoring	Locations	Sampling Frequency	Sampling Performed By	Purpose
OFF SITE				
Uncharacterized Discharges	5 primary locations, but could vary with circumstances of discharge	As needed[a]	Site personnel	Assess impact of uncharacterized discharges on community water supply facilities
Community Assurance	4 points in Westminster and Broomfield water treatment process streams	Weekly, with samples composited semiannually or annually	Westminster and Broomfield municipal employees	Notify municipalities in the event of water-quality exceedances; provide data for dose reconstruction studies

[a] Sampling frequency is determined based on project plans. (Refer to FY05 *IMP Background Document* for more information.)

Notes:

CDPHE = Colorado Department of Public Health and Environment
NPDES = National Pollutant Discharge Elimination System
POC = Point of compliance
RFCA = Rocky Flats Cleanup Agreement
RFETS = Rocky Flats Environmental Technology Site

- Locating the source of contamination detected by the monitoring objectives described in subsequent sections of the IMP;
- Monitoring at stormwater outfalls to evaluate a) the effectiveness of the RFETS Stormwater Pollution Prevention Program, and b) whether stormwater discharges are adversely affecting Segment 5 water quality;
- Specific monitoring activities in response to requests (i.e., *ad hoc* monitoring);
- Monitoring of indicator parameters to evaluate concentrations and levels of laboratory analyzed constituents; and
- Monitoring performed for operational reasons and BMP evaluation, but not enforceable under RFCA, or federal and state laws and regulations.

The Site-wide monitoring is described below.

2.2.1 MONITORING DAM OPERATIONS

The RFETS detention ponds (Figure 1) are formed by earthen dams, which are designed for stormwater detention. Once water quality is determined to meet downstream standards, water is routinely discharged in a controlled manner from the final or terminal ponds to maintain safe pool levels. Although water rarely rises to the elevation of emergency spillways, there is a risk that the dams could fail or sustain damage under extreme conditions.

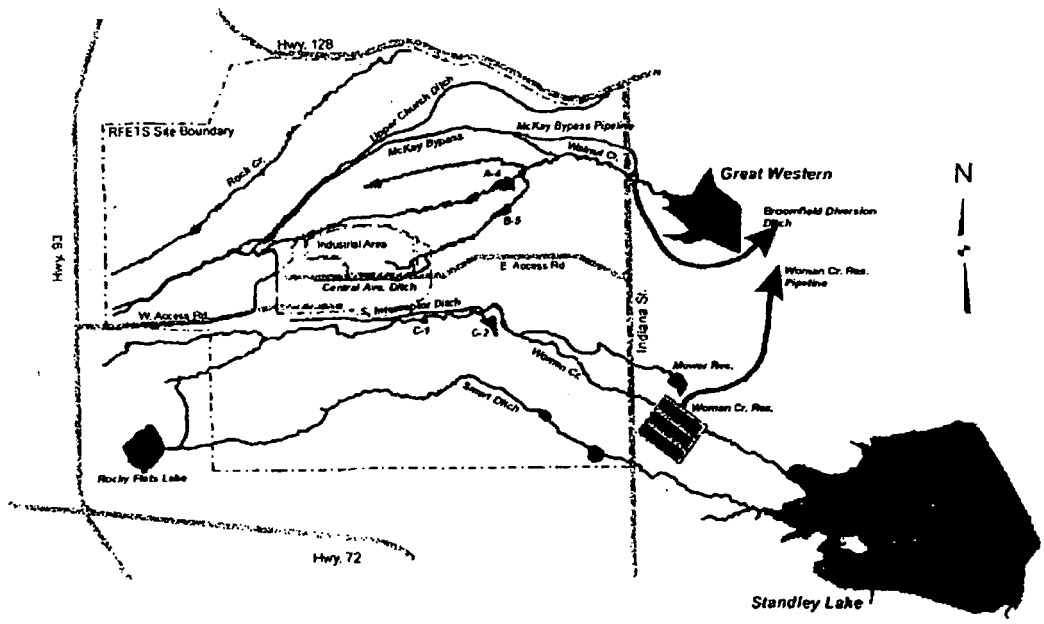

Figure 1. Schematic Surface-Water Map

RFETS uses data from the monitoring activities listed below, along with water-quality data from the ponds, within a specific decision-making process (see FY05 *IMP Background Document*, Section 2.2.1, and ancillary documents cited therein) to determine if, and when, water should be discharged from the ponds. RFETS performs the following monitoring activities:

- Measure streamflow upgradient of Ponds A-3, A-4, B-5, and C-2.
- Measure outflow from Ponds A-3, A-4, B-5, and C-2.
- Monitor pond water elevations at regular intervals in Pond A-3, Landfill Pond, and terminal ponds A-4, B-5, and C-2. Weekly to monthly monitoring is adequate for normal operations; daily or even hourly monitoring is invoked as established by procedure (e.g., in response to storms) to ensure dam safety.
- Monitor piezometers installed in the dams to track the level of the saturated zone within the earthen detention structures.
- Evaluate dam integrity through visual inspections at appropriate frequencies as determined by best engineering judgement or procedure.
- Perform routine integrity inspections on dams on the 12 ponds at appropriate frequencies, as determined by best engineering judgement, and perform a detailed internal inspection annually. Federal Energy Regulatory Commission and DOE personnel conduct an annual external inspection of the dams.
- Monitor the inclinometers and dam crest movement monuments twice a year to identify any movement of dam structure.
- Annually exercise the valves in the outlet works of the terminal dams to ensure operability, as directed by the Colorado State Engineer.

Data are entered into a spreadsheet model to assess the need for discharge, based on the *Pond Operations Plan* (Kaiser-Hill and Rocky Mountain Remediation Services [RMRS], 1996) and applicable procedures. Meteorological data are also used in the model, along with inflow and discharge rates as applicable.

2.2.2 LOCATING NEW CONTAMINANT SOURCES

If new contamination is indicated by surface-water monitoring, New Source Detection stations, Point of Evaluation (POE) stations, or Point of Compliance (POC) stations, RFETS may use portable sampling equipment to help further isolate the source. This monitoring may cross the boundaries of other surface-water monitoring objectives. For instance, if contaminants are detected outside the Industrial Area, portable sampling equipment may be deployed inside the Industrial Area to locate the source of the contaminants (see FY05 *IMP Background Document*, Section 2.2.2).

2.2.3 AD HOC MONITORING

Ad hoc monitoring is designed to address specific identified data needs. The data needs arise in response to circumstances that are not addressed by the routine monitoring program. *Ad hoc* monitoring falls into one of two categories:

- Required—Statutory, regulatory, permit, or other requirements mandate that monitoring must be done to obtain analytical data; and
- Discretionary—Where analytical data could help with further decision making, or a need for additional data is otherwise strongly indicated.

Ad hoc monitoring may be conducted in response to events such as unusual precipitation volumes, community concerns, changes in permit or regulatory requirements, construction projects, operations, or spills.

2.2.4 INDICATOR PARAMETER MONITORING FOR ANALYTICAL WATER-QUALITY ASSESSMENT

RFETS continues to study whether a correlation can establish relationships between analytical measurements of constituents, such as actinides or metals, and selected indicator parameters (i.e., total suspended solids [TSS], turbidity, precipitation, and flow rate).

Plutonium concentrations are already being monitored at the terminal pond outfalls and at the Indiana Street RFCA POCs. RFETS also monitors TSS concentrations when possible for samples collected at the locations covered by the other decision rules in this section. To evaluate the relationship between turbidity and analytical constituents, turbidity is monitored at the locations where required by the other applicable decision rules. To evaluate the relationship between precipitation and analytical constituents, precipitation is currently monitored at 12 locations across RFETS.

RFETS is continuing to evaluate the data to study the correlation between actinide and metals concentrations, and levels of selected indicator parameters. Based on this analysis, this monitoring objective may be modified in the future to further define observed correlations. Although correlation can be demonstrated under some conditions, the results have not shown a reliable quantitative correlation across the Site sufficient to allow indicator parameters to be substituted for the primary measurements. The indicator parameters prove useful as an investigative tool to assist in understanding source-related environmental conditions.

2.3 WATER QUALITY WITHIN THE INDUSTRIAL AREA

RFETS monitors water within the Industrial Area to detect new sources of contamination, to assess the performance of facilities or project elements (e.g., during closure of a facility) in preventing releases of specific constituents, and to assess the quality of incidental rainwater or snowmelt that may accumulate in utility pits and bermed areas. Indications of a contaminant release would trigger reporting and decision making for response and remediation. RFETS conducts the following activities under this portion of the surface-water monitoring program:

- Project-specific performance monitoring; and
- Managing incidental waters.

2.3.1 INCIDENTAL WATER

At RFETS, about 85 occurrences of incidental water per year require monitoring. Water that accumulates in utility pits, berms, footing drains, sumps, and excavation sites, or that is discharged within buildings or onto the ground, is evaluated using field screening observations

and measurements, coupled with the process knowledge of RFETS personnel and/or specific analytical tests. Additional analysis is required if the circumstances or field observations provide cause to suspect the presence of oil, or hazardous or radioactive constituents.

The program for monitoring incidental water and non-stormwaters is governed by the RFETS NPDES permit and provides for routine, data-driven decision making on whether to allow discharge of these waters into the environment without treatment. When evaluating incidental water, field personnel estimate the volume of water present, note its appearance (especially its color or presence of a visible sheen), and field test its pH, nitrate level, and conductivity. In conjunction with knowledge of the processes occurring in the immediate vicinity, these data guide the process of deciding how to dispose of the incidental water. Water that cannot be discharged to the environment may be managed under other applicable regulations.

2.3.2 SANITARY SYSTEM MONITORING

Historically, this section of the IMP described monitoring requirements driven by the RFETS NPDES permit conducted primarily to assure the compliant operation of the RFETS wastewater treatment plant (WWTP). The plant ceased accepting wastewater flows on the first day of FY05. Some operations continued for a week or two following the cessation of service, but for all intents and purposes, the plant was closed. The agencies have been notified that Outfall STP1 of the NPDES permit has been abandoned and will no longer be monitored. The FY04 Sanitary System Monitoring sections are deleted from this FY05 IMP. For any operations that continued into the first few weeks of FY05, the applicable FY04 objectives were continued until operations ceased. The FY04 IMP may be referenced for the types of monitoring that have been done within the sanitary system. The FY04 IMP also serves as reference to the final reports that will be prepared, as required by the NPDES permit, for the last year of operation.

2.3.3 PERFORMANCE MONITORING IN SURFACE WATER

Performance monitoring may be specific to individual projects (e.g., decommissioning, remedial activities, transition actions, or BMPs for transport and fate of contaminants in surface-water runoff) within the Industrial Area. While performance monitoring may be conducted at any location on RFETS, most monitoring occurs within the Industrial Area. In general, project-specific monitoring targets 18 months of data prior to project startup to establish baseline conditions, and continues for three months after project completion.

2.3.4 MONITORING NPDES DISCHARGES TO PONDS

The NPDES permit program controls the discharge of pollutants into the waters of the United States, and requires routine monitoring of point source discharges and reporting of results. The first RFETS NPDES permit was issued by EPA in 1974. The current permit was renewed in 2000. Monitoring for NPDES compliance is prescriptively required by EPA, and is not covered by the IMP process or detailed in this document. The RFETS NPDES permit prescribes that stormwater discharges will be monitored in accordance with the stormwater provisions of this IMP.

The renewed RFETS permit identified one monitoring point for control of discharges, the WWTP (Building 995) effluent. The NPDES/Federal Facility Compliance Agreement was terminated by the renewal of the permit. Modifications included the elimination of discharge

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points except for the WWTP discharge point. Operations at the WWTP ceased in November 2004, and the facility is scheduled for demolition in the 2nd Quarter of FY05. The other previously permitted discharge locations are now regulated under CERCLA via the RFCA. Additional expanded scope includes requirements for stormwater monitoring, stormwater pollution prevention plan, and associated annual comprehensive Site compliance evaluations. New stormwater monitoring provisions result from new regulations promulgated since the 1984 permit renewal. Refer to the permit for specific monitoring requirements.

2.4 INDUSTRIAL AREA DISCHARGES TO PONDS

Industrial Area discharges to the ponds include surface-water runoff and waters in Segment 5 that include the stream channels and interior ponds. Under this portion of the surface-water monitoring program, RFETS monitors Segment 5 water quality.

2.4.1 NEW SOURCE DETECTION

RFETS collects surface-water samples at stations SW022, SW091, SW093, SW027, and GS10, which are located in the upper reaches of the three main drainages through which runoff leaves the Industrial Area. Analytes of interest (AoIs) include plutonium, uranium, and americium isotopes; water-quality parameters, including turbidity, pH, nitrate, and conductivity (measured every 15 minutes); precipitation data (measured continuously at SW022); and flow rate (measured continuously). Additional AoIs also may be identified.

The "indicator parameters," those that can be and are monitored continuously, provide a qualitative early warning of potential contaminant releases without the long turnaround time or cost of more frequent sample analyses for specific contaminants. For example, plutonium and americium concentrations may be correlated with TSS (which correlates with turbidity), and plutonium may be correlated with nitrate concentrations. Additionally, levels of chromium, beryllium, silver, and cadmium may correlate with conductivity readings. If a continuously monitored parameter provides cause for concern about a particular contaminant, samples may be collected and analyzed for that contaminant. It should be noted that none of the monitoring to date clearly demonstrates the correlations suggested here.

2.4.2 STREAM SEGMENT 5

RFETS monitors Segment 5 water quality at three RFCA POE monitoring locations (as represented by stations SW093, SW027, and GS10) for compliance with RFCA action levels. Reportable values require development of a source evaluation plan and source evaluation.

The RFCA Action Levels and Standards Framework (ALF) provides criteria for identified contaminants. A subset of these contaminants is monitored under this portion of the program (see Table A-5 in Appendix A to the FY05 *IMP Background Document*). RFETS collects samples (one to four per month depending on flows) from each station for an estimated total of 87 samples during the year (see Table 2-13 in the FY05 *IMP Background Document*). The number of samples collected from each station is determined using historical flow data. Approximately 15 liters (L) of water are collected for each 500,000 gallons of stream flow to a maximum of four per month, and each 15-L sample composite is designed to contain about 50 flow-paced grab samples.

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Collecting only one sample per month and analyzing only for the AoIs listed above would be sufficient to comply with RFCA requirements. However, the higher number of samples reduces the chance of recording a false exceedance or of missing a short-duration contaminant surge. Sampling frequency may be adjusted to accommodate changing data needs.

2.5 WATER LEAVING THE SITE

Water leaves the Site in Stream Segment 4 at Indiana Street. Three monitoring objectives have been established to assess Segment 4 water quality:

- Predischarge monitoring;
- RFCA POC monitoring of Segment 4; and
- Additional, non-POC monitoring.

2.5.1 PREDISCHARGE MONITORING

Before water is discharged from the terminal ponds, it must be evaluated for a range of constituents to ensure its safety and that unexpected contaminants have not been introduced. Therefore, RFETS collects predischarge samples 8 to 10 times per year from the Walnut Creek Drainage at Ponds A-4 (North Walnut Creek) and B-5 (South Walnut Creek), once per year from the Woman Creek Drainage at Pond C-2, and as needed from any other pond temporarily functioning as a terminal pond. RFETS and CDPHE analyze the samples for an extensive list of constituents, including inorganic compounds, metals, and radiologic parameters (see Tables 2-15 and 2-16 in the FY05 *IMP Background Document* for analyte list and sampling targets). Sampling and analyses are conducted far enough in advance of a planned discharge to allow action to be taken if exceedances are noted, but near enough to the time of discharge to be representative of the discharge composition.

2.5.2 SEGMENT 4 COMPLIANCE MONITORING

RFETS performs monitoring at five RFCA POC stations in Segment 4 (GS11, GS08, GS31, GS03, and GS01). POC monitoring is concerned primarily with concentrations of plutonium, americium, and total uranium. About three samples are collected during each pond discharge event (about 8 to 10 discharge events per year; see Table 2-19 in the FY05 *IMP Background Document* for POC monitoring targets), and flow-proportional sampling is conducted between discharges when flow rates are sufficient to obtain required water sample volumes.

2.5.3 CDPHE MONITORING AT INDIANA STREET

Various off-Site reservoir construction and water diversion projects will cause changes in the surface-water flow regime. CDPHE conducts additional monitoring to assess the effects of these flow changes on nutrient loads in water leaving RFETS. CDPHE collects samples quarterly from Walnut Creek to assess the composition of the water when it consists of:

- 100% RFETS effluent;
- Mixed effluent and natural stream flow; or
- 100% natural stream flow.

In addition to these samples, CDPHE collects an annual sample from Woman Creek during a Pond C-2 discharge. Samples are analyzed for a variety of parameters, including water quality and selected metals.

2.6 OFF-SITE MONITORING TO SUPPORT COMMUNITY WATER SUPPLY MANAGEMENT

RFETS and CDPHE personnel provide monitoring data to nearby communities for their use. Procedures are in place to monitor uncharacterized discharges from RFETS and to provide data that address public concerns regarding water quality.

2.6.1 MONITORING UNCHARACTERIZED DISCHARGES

Monitoring of uncharacterized discharges would normally be required only if monitoring, specified under the previous decision rules, is not performed in accordance with the sampling and analysis protocols (e.g., POC monitoring at Indiana Street) or if flow leaving RFETS exceeds the capacity of the downstream ditch or reservoirs.

If surface water of unknown quality (unmonitored) leaves RFETS, it is necessary to demonstrate that the water quality is acceptable to downstream users. Examples include:

- Unmonitored storm flow exceeding the capacity of Broomfield's diversion ditch that enters Great Western Reservoir; and
- Downstream water that may have been impacted by unmonitored effluent from RFETS.

2.6.2 COMMUNITY ASSURANCE MONITORING

Several factors have made it necessary for the communities to reassure residents that their environment is safe. These factors include the Site's past mission as a nuclear weapons production facility, the nature of the contaminants, the history of releases and accidents, and the geographic and hydrologic relationship of RFETS to the neighboring municipalities. Adequate and timely information regarding the impact of RFETS is necessary. The level of concern fluctuates with activities at RFETS, but may be expected to continue as long as environmental contamination is present at RFETS.

Since the completion of the Standley Lake Protection Project and the Great Western Reservoir Replacement Project, which were designed to protect potable water supplies, routine monitoring of the municipal treatment and distribution systems is no longer warranted. However, Great Western Reservoir is still used as an irrigation supply. Therefore, during FY05, community assurance monitoring continues at Great Western Reservoir as specified in Section 2.6.2 of the FY05 *IMP Background Document.*

2.7 WATERSHED INTEGRATION

Geographically, RFETS lies at the head of the Big Dry Creek Basin; functionally, every effort has been made to isolate RFETS from the rest of the watershed. Historical strategies on the part of RFETS and the downstream communities have focused on limiting, to the maximum extent possible, the natural flow of surface water from RFETS. Examples include past spray irrigation practices, the "Zero Discharge" goal, and the continuing detention of stormwater pending

demonstration of acceptable water quality. Although these water management practices have been necessary to protect and reassure the downstream communities, they negatively impact the ecology of the basin and are inconsistent with the ultimate vision for the Site, as outlined in RFCA. As RFETS moves toward closure, the focus must evolve toward integrating the headwaters of Big Dry Creek with the rest of the watershed.

To accomplish this objective, RFETS must extend its water management strategy beyond Indiana Street, and participate with other stakeholders in identifying and implementing appropriate water-quality and use goals for the basin. During 1996, DOE and its contractors progressed toward this goal by actively participating in a consensus group with the objective of achieving agreement on as many issues as possible prior to a standard-setting hearing before the Colorado Water Quality Control Commission. The group included representatives from RFETS, regulatory agencies and surrounding communities, but the focus was limited to water-quality issues impacting wastewater dischargers.

More recently, RFETS personnel helped to establish the Big Dry Creek Watershed Association (BDCWA). The BDCWA began as an extension of the original consensus group, but has evolved to include any entities or individuals interested in water-related issues within the basin. In addition to the original four dischargers (i.e., RFETS, Broomfield, Westminster, and Northglenn), participants include representatives of agriculture, land owners, parks, recreation, open space, and a variety of government agencies. The BDCWA has been recognized by the Denver Regional Council of Governments (DRCOG) as a district watershed in the Regional Clean Water Plan. The goals of the BDCWA include public education, monitoring activities, and protection of water quality, aquatic life, and habitat.

DOE has recognized the effectiveness of this approach by becoming a party to a formal agreement to participate, with the cities, in supporting monitoring activities within the basin. The agreement states that such support may consist of monetary contributions or in-kind services, but shall be equitably distributed among the parties. Monitoring decisions are made jointly by the group, with input from regulators and planning agencies including EPA, the Water Quality Control Division, and DRCOG. The immediate use of the data is to characterize the watershed, and to identify and quantify sources of impairment. Ultimately, water quality and biological data will be used to support water-quality standards, native species protection, and basin-wide planning activities. A coordinated effort to obtain accurate information about existing conditions and relative impacts is beneficial and cost-effective for stakeholders.

2.8 PROJECT-SPECIFIC MONITORING

Project-specific performance monitoring must be detailed in a project plan through the review and approval process when the project poses a concern for a specific contaminant release, especially for a contaminant that may not be adequately monitored by other monitoring objectives downstream. Each performance monitoring location will target the contaminants of greatest concern, as identified by the implementing organization, for the specific action. Performance monitoring for specific analytes as specified in Section 2.3.3 of the FY05 *IMP Background Document* may be needed for decommissioning actions, remedial actions, transition actions, and BMPs for the control of plutonium transport in surface-water runoff.

Project-specific performance monitoring stations must be sited to monitor specific high-risk Site activities, such as decommissioning activities. These project-specific stations will be placed

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upstream from the routine monitoring stations (assuming more than one source area could be contributing to the routine location), to ensure the monitor will be quantitative for releases of AoI. Data types must be specified in the project plan, and analyte suites and sample collection protocols are project specific. The schedule for performance monitoring will vary with individual projects. However, the initiation will begin far enough in advance of project initiation that a statistically defensible baseline can be established. Monitoring will continue during the project activities at a rate that allows the project managers and monitoring staff to make timely changes in activities that may be impacting the water channel. The frequency will be specified in the project's Sampling and Analysis Plan. After project completion, monitoring will continue long enough to identify residual impacts to surface-water quality that may be attributable to the project activities.

3.0 GROUNDWATER MONITORING

This section summarizes the Groundwater Monitoring Program at RFETS. For complete details, see the FY05 *IMP Background Document*. The Groundwater Monitoring Program is designed to accomplish the following:

- Monitor groundwater contaminant concentrations within and downgradient of major contaminant plumes;
- Monitor contaminant pathways to surface water;
- Evaluate the potential impact of contaminated groundwater on surface water;
- Comply with decision documents that include groundwater monitoring requirements; and
- Assess the effectiveness of RFETS's remediation activities as specified in decision documents.

3.1 GROUNDWATER MONITORING FOCUS

Contaminant plumes have been identified in RFETS groundwater (for example, see the *2003 Annual RFCA Groundwater Monitoring Report*, Kaiser-Hill, 2004c). The main AoIs in groundwater are volatile organic compounds (VOCs), nitrate, and uranium. Possible sources of contaminants that could affect groundwater include former storage tanks, process waste lines, drains, sumps, historical storage and disposal areas, and spills. The monitoring network is designed from a holistic, Site-wide perspective; its primary objective is to evaluate potential impacts of known groundwater contaminant plumes on surface-water quality, by focusing on monitoring groundwater within and downgradient of contaminant plumes and in surface-water drainages.

The FY05 IMP establishes new monitoring well classifications and a new system of evaluating groundwater contaminant concentrations. This system includes three main evaluation criteria:

- Statistically-derived 85th percentile concentrations to be compared with surface-water standards;
- Specific statistical methods to determine concentration trends; and
- Comparison with Wildlife Refuge Worker Surface Water Preliminary Remediation Goals (WRW SWPRGs).

The groundwater monitoring network (Figure 2) is now defined with the following well classifications, the first three of which comprise the majority of the network:

- Area of Concern (AOC) Wells: Located within a drainage and downgradient of a contaminant plume or group of contaminant plumes. These wells are monitored to determine whether the plume(s) may be discharging to surface water.
- Sentinel Wells: Typically located near downgradient edges of contaminant plumes, in drainages, and at and downgradient of groundwater treatment systems. These wells are monitored to determine whether concentrations of contaminants are increasing, which could indicate plume migration or treatment system problems.

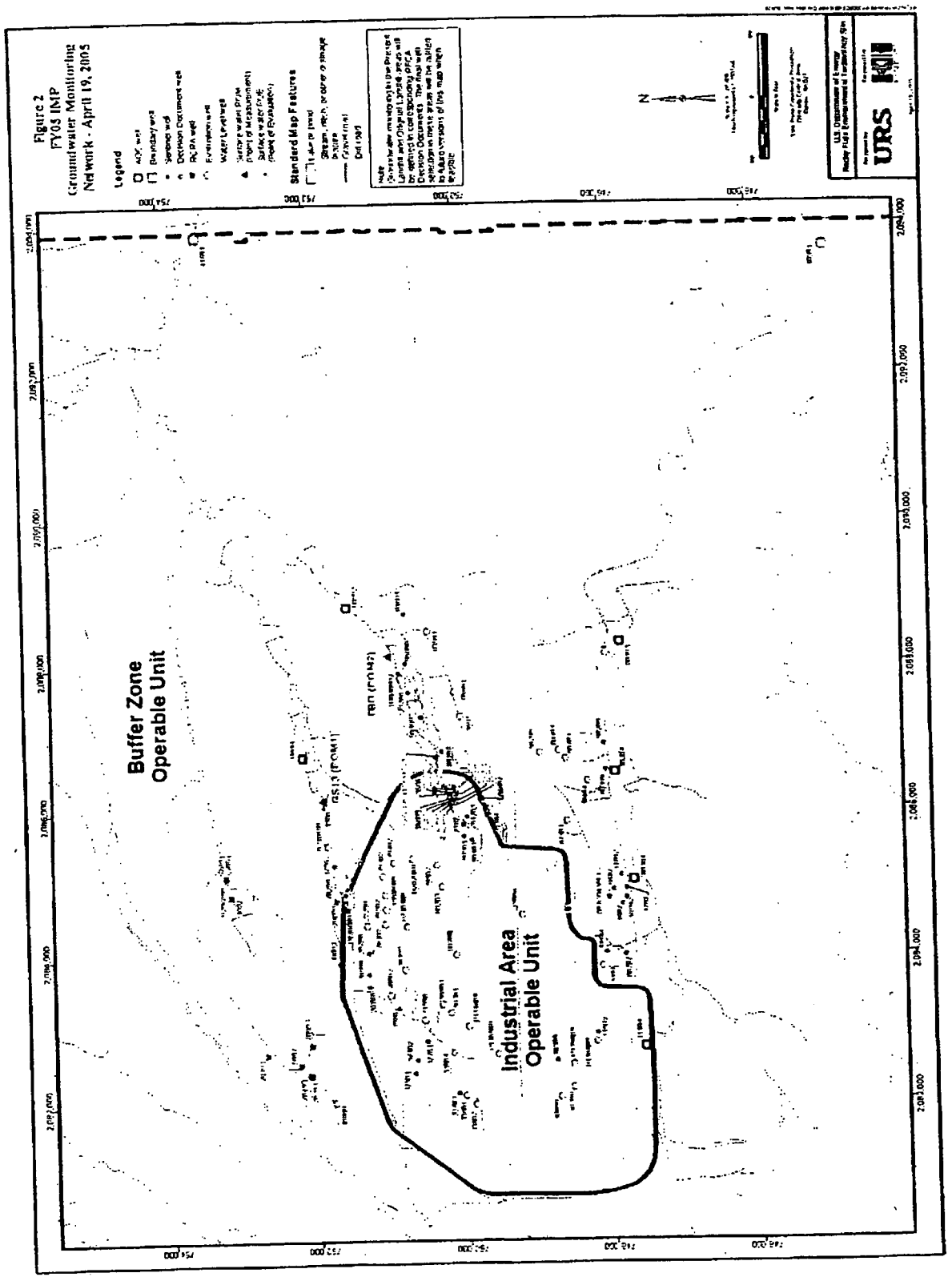
Figure 2
FY05 IMP
Groundwater Monitoring
Network - April 19, 2005
Legend
Standard Map Features
Buffer Zone
Operable Unit
Industrial Area
Operable Unit
URS

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- Evaluation Wells: Typically located within plumes and near plume source areas, or in the interior of the Industrial Area. Data from these wells will help determine when monitoring of an area or plume can cease. A subset of these wells is located in areas that may experience significant changes in groundwater conditions as a result of Site closure activities.
- Boundary Wells: Located on the east boundary of the Site, where Walnut Creek and Woman Creek flow off Site. These wells are used to show that AoIs are not migrating off Site.
- RCRA Wells: Dedicated to monitoring the Present Landfill and East Landfill Pond to determine the effects on groundwater resulting from this closed facility.
- Decision Document Wells: Wells identified in any of four decision documents and that are recommended by the Groundwater IMP Working Group for removal from the monitoring network when these documents are modified or replaced. Those identified in a decision document and recommended for retention in the network are incorporated in the monitoring network under other well classifications (e.g., Sentinel, Evaluation). The four decision documents are: *Major Modification to the Operable Unit 1: 881 Hillside Area Corrective Action Decision/Record of Decision* (DOE, 2001); *Decision Document for the Mound Site Plume* (DOE, 1997); *Proposed Action Memorandum for the East Trenches Plume* (DOE, 1999a); and *Final Solar Ponds Plume Decision Document* (DOE, 1999b).

The groundwater monitoring network also includes two monitoring classifications that do not provide analytical data on groundwater in specific locations:

- Water Level Wells: Located between areas being actively monitored, in areas subject to changing flow conditions during and following Site closure, and in areas addressed by decision documents (see above). These wells are routinely monitored for water levels only (not analytical data).
- Groundwater Treatment System Monitoring Points: Three groundwater treatment systems at the Site collect and treat contaminated groundwater and discharge the treated water to groundwater or surface water. Each system is monitored, at a minimum, for influent and effluent water quality, and for impacts to surface water downstream of the effluent discharge point.

Included within these well classifications are wells that satisfy the performance monitoring requirements of remedial actions at the Site that have addressed contaminant source areas and groundwater plumes.

Section 3.3.9 of the FY05 *IMP Background Document* provides a more thorough discussion of the well classifications and associated well classification-specific DQOs. Refer to Section 3.3.3.2 for 85th percentile calculations, Section 3.3.3.3 for trend testing, and Section 3.3.3.4 for information on the WRW SWPRG comparison.

For most of the wells in the monitoring network, some or all of these evaluation criteria will apply. However, these criteria will not apply to RCRA wells monitoring the Present Landfill. Evaluation criteria for RCRA wells will be stipulated in the *Present Landfill Interim Measures/Interim Remedial Actions (IM/IRA)* document (in progress).

Concentrations of contaminants in groundwater samples from AOC wells will be compared against all three evaluation criteria described above. If evaluation thresholds are exceeded, a groundwater evaluation will be performed to determine the cause and to determine any appropriate action. Groundwater concentration data from Evaluation wells that are located within contaminant plumes will only be assessed for whether monitoring of a plume may cease. Samples from these wells are anticipated to continue to show elevated concentrations and will not require any action. Instead, decreasing concentrations will lead to a termination of monitoring when concentrations are below a specific threshold. Groundwater concentration data from Sentinel wells that are located near downgradient plume edges, between AOC and Evaluation wells, may be evaluated as part of the CERCLA periodic review, using the first two criteria listed above. See Section 3.3 of the FY05 *IMP Background Document* for more detailed discussion of DQOs and decisions.

Water-level measurements will be collected at most wells, not only at Water Level wells. The resulting data are incorporated into potentiometric surface maps and hydrographs to define groundwater gradients and flow rates. Both the water-level measurements and the sampling and analysis activities provide temporal data for use in assessing trends.

3.2 GROUNDWATER MONITORING PROGRAM

The Groundwater Monitoring Program includes the following components (see FY05 *IMP Background Document,* Appendix B, for tables of monitoring locations and analytical suites):

- Sampling of monitoring wells;
- Measurement of water-table elevations;
- Data management, interpretation, and reporting;
- Groundwater evaluations; and
- Well installation, maintenance, abandonment, and replacement.

Table 2 lists the frequency and number of monitoring wells for samples and water levels.

3.2.1 WELL LOCATIONS

Most of the groundwater at RFETS is hydraulically connected to surface water. Groundwater monitoring wells have been installed along known or suspected pathways between contaminated areas and surface water. The majority of the monitored wells are located around the perimeter of the Industrial Area, the former Operable Unit (OU) 2, and the Present Landfill. Additional wells are located within RFETS drainages where stream flow is present at least some portion of the year. Boundary wells are maintained at the downgradient (eastern) RFETS boundary. The monitoring well classifications are populated as follows (not including flow monitoring):

- AOC: 6 wells;
- Sentinel: 29 wells;
- Evaluation: 39 wells;
- Boundary: 2 wells;

Table 2. Groundwater Monitoring Matrix

Type of Monitoring	Locations	Well Classification	Sampling Frequency	Purpose
Measure analyte concentrations	35 wells	AOC and Sentinel	Semi-annually	Monitor analyte concentrations in groundwater at downgradient plume edges and in drainages
Measure analyte concentrations	9 wells	RCRA	Quarterly	Monitor RCRA analyte concentrations in groundwater at Present Landfill
Measure analyte concentrations	39 wells	Evaluation	Biennially	Monitor analyte concentrations in groundwater within plumes and within Industrial Area
Measure analyte concentrations	2 wells	Decision Document	Quarterly	Monitor per OU1 CAD/ROD
Measure analyte concentrations	7 wells	Decision Document	Semi-annually	Monitor per OU1 CAD/ROD or decision document that applies to groundwater treatment system
Measure analyte concentrations	2 wells	Boundary	Annually	Monitor analyte concentrations in groundwater at east Site boundary
Water-level measurement	119 wells	All (AOC, Sentinel, Evaluation, RCRA, Decision Document, Boundary, and Water Level) except 891COLWEL	At least semi-annually	Monitor groundwater flow regime
Measure analyte concentrations	7 treatment system monitoring points and 3 surface-water locations	Treatment systems	Semi-annually	Monitor analyte concentrations in influent to and effluent from treatment systems, and in surface water downstream of effluent discharge location

Notes:
AOC = Area of Concern
CAD/ROD = Corrective Action Decision/Record of Decision
OU1 = Operable Unit 1
RCRA = Resource Conservation and Recovery Act

- RCRA: 9 wells; and
- Decision Document: 9 wells.

In addition, monitoring of the three groundwater intercept/treatment system monitoring points is performed as a part of the groundwater portion of the IMP. Ten locations are monitored for this purpose.

3.2.2 GROUNDWATER SAMPLING AND ANALYSIS

During sample collection activities at each monitoring well, the sampling crew measures field parameters including groundwater temperature, pH, conductivity, turbidity, and total alkalinity. At most of the wells identified for analytical sampling, the crews will collect one or more of the following three samples:

- Unfiltered samples for analysis of VOCs;
- Unfiltered samples for analysis of nitrate; and
- Filtered or unfiltered samples for analysis of total (not isotopic) uranium.

AoIs vary between wells depending on the constituents present in each plume at or upgradient of the well. In past years, the activities of several uranium isotopes were measured. In FY05, the total concentration of uranium (irrespective of isotopes) will be measured. See Section 3.3.3.5 and Appendix B in the FY05 *IMP Background Document* for more information.

The groundwater flow regime at RFETS limits sample volumes from many wells. If sample volume precludes collection and analysis of the entire analyte suite for a particular well, the analytes are prioritized based on the objectives of the well. The following list shows the usual analyte priority; however, this priority may be modified to meet the sampling objectives for a particular well:

1) VOCs
2) Nitrate
3) Total uranium

Historically, analytical suites at the RCRA wells monitoring the Present Landfill have been different from the suite listed above. A different suite may be defined by the *Present Landfill IM/IRA*, but until that document is approved, the RCRA wells will continue to be sampled for VOCs, nitrate, metals, uranium isotopes, fluoride, and sulfate, generally in that order of priority (with the fluoride and sulfate analyses taken from the same bottle).

Samples from four wells, one located north of Building 371 and three north of Building 771, will also be analyzed for plutonium and americium. Samples from one well located north of the Mound Site Plume Treatment System will be monitored for VOCs, uranium, plutonium, americium, gross alpha, and gross beta.

3.3 GROUNDWATER DATA DISPOSITION

3.3.1 DATABASES

Analytical Services Division personnel enter field data and analytical data into the Rocky Flats Soil and Water Database. Data integrity is maintained through the use of standard data entry operating procedures and by running error-checking routines when loading data.

Data are extracted for various uses, including quarterly reporting, annual reporting, and *ad hoc* queries to support other Site projects. These data are also mapped using a geographic information system to delineate the distribution and movement of groundwater and constituents in groundwater.

3.3.2 REPORTING

Groundwater monitoring activities are reported through the following vehicles:

- **RFCA Reporting:** Data will be presented in a Quarterly RFCA Groundwater Monitoring Report. Included will be notification of any exceedances of groundwater action levels and required actions for exceedances. These reports replace all historic quarterly reporting, integrating the elements of each regulatory driver into a single reporting vehicle.

  Relevant information that was previously presented on a routine basis in the Annual RFCA Groundwater Monitoring Reports will be incorporated into quarterly RFCA reports.

  In FY05, reports will be are presented at the Quarterly Information Exchange Meetings, which are held off Site and are open to the public.

- **IMP:** The IMP will be reviewed and updated quarterly, as needed, during FY05. The IMP is the vehicle for documenting required Groundwater Monitoring Program elements.

3.4 GROUNDWATER EVALUATIONS

Some of the DQOs for groundwater monitoring require an evaluation of the potential impact of groundwater contamination on surface-water quality (see Section 3.3.5 of the FY05 *IMP Background Document*). If AoI concentrations at AOC wells satisfy the requirements (see Section 3.3.9.1 of the FY05 *IMP Background Document*), an evaluation will be performed. DQOs will be developed and presented as part of the groundwater evaluation.

3.5 WELL ABANDONMENT AND REPLACEMENT PROGRAM

Section 3.5.7 of the FY05 *IMP Background Document* describes the Well Abandonment and Replacement Program (WARP), which is responsible for removing damaged and unnecessary wells and installing replacement wells as needed. RFETS personnel maintain a database of well locations, construction, permitting, and other relevant information. The Site geologic core repository is no longer maintained and has been disposed. A file of geologic core logs is maintained.

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Well abandonment is considered if a well is damaged or no longer needed, or is poorly constructed for long-term monitoring. Well replacement is considered if a well is part of the long-term monitoring network and is damaged or is not constructed appropriately for long-term monitoring. Activities conducted under the WARP will be reported in a special *WARP Closeout Report* to be issued in approximately October 2005.

3.6 PROJECT-SPECIFIC MONITORING

Groundwater monitoring to support project-specific remediation and decommissioning activities has sharply decreased and will likely terminate in FY05. It may be necessary to perform monitoring for some projects as yet unidentified, and such monitoring will be performed on an as-needed basis. This monitoring is intended to detect potential impacts on groundwater quality from a specific closure project. If necessary, monitoring to support this objective can employ any of the existing IMP wells that may be appropriately located.

In cases where monitoring is not currently performed, or when there is a need for additional information near the planned activity, AoIs will be identified based on knowledge of historic operations. Wells will be placed downgradient of potential contaminant sources. Upgradient wells may be required if existing upgradient data are not available. Sampling protocols will be established for individual projects and sampling will be scheduled as appropriate to the specific closure project. If continued monitoring is necessary, monitoring requirements will be added to the IMP during the quarterly update cycle.

4.0 AIR QUALITY MONITORING

4.1 PURPOSE AND PROGRAMS

Air monitoring activities at RFETS (listed in Table 3) assist in both protecting and informing the public, and in protecting the environment, by detecting and trending the impacts of RFETS operations on air quality at and near RFETS. Monitoring characterizes airborne radionuclide materials that may be introduced and identifies the associated meteorological conditions that influence the transport and dispersion of the airborne materials. Data are used to plan, implement, and assess the effects of on-Site activities including operations, construction, and closure activities, and to maintain emergency preparedness and demonstrate compliance with relevant regulations.

The Air Quality Management (AQM) group within Kaiser-Hill's Environmental Systems and Stewardship (ESS) organization determines the scope of RFETS air monitoring and reporting activities required to maintain compliance with air quality regulations and DOE Orders. Additional air monitoring is performed by CDPHE or coordinated by DOE.

4.1.1 AMBIENT AIR MONITORING

Ambient monitoring of radionuclides on RFETS and at the perimeter is performed by ESS. CDPHE monitors radioactive and non-radioactive pollutants on and around RFETS. Ambient monitoring in the communities immediately adjacent to RFETS has been supported further by DOE through the Community Radiation (ComRad) program. ComRad stations, which monitor airborne plutonium concentrations, are operated independently through a DOE grant overseen by the Community Oversight Panel representing local governments.

4.1.2 EFFLUENT AIR MONITORING

Air emissions (effluent) from RFETS facilities that have the potential to contain significant quantities of radioactive materials are monitored continuously in accordance with state and federal regulatory requirements and agreements. Effluent monitoring is used to verify the effectiveness of radiation control mechanisms, and may be used as part of the evaluation process to keep radioactive emissions as low as reasonably achievable. Effluent monitoring has been discontinued as facilities enter active decommissioning, an activity characterized by conditions that prevent accurate quantification of emissions due to factors such as the loss of building infrastructure that supports effluent sampling, unpredictable variability in effluent flows as ductwork and plenums are decommissioned, and radiological postings that prevent access to effluent samplers. Currently, all Site buildings that were historically subject to effluent monitoring have either entered into active decommissioning or have been demolished, with one exception. A single building effluent sampling point remains active, and this last monitored facility is expected to enter active decommissioning during the second quarter of FY05. At that time, the effluent monitoring program will be permanently terminated.

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Table 3. Air Monitoring Matrix

Type of Monitoring	Analyte	Locations	Performed By	Sampling Frequency	Purpose
Routine ambient air	Radio-particulate	25 RAAMP samplers[4]	RFETS AQM	Continuous (monthly filter exchange; monthly analyses of 14 perimeter samplers)[a]	Detect and characterize Site-related airborne radiological emissions and demonstrate compliance with state and federal regulations
Effluent from Industrial Area facilities	Radio-particulate	1 exhaust outlet	RFETS AQM	Continuous (weekly filter changes with monthly compositing and analysis)	Verify effectiveness of radiation control mechanisms and provide secondary compliance data
Project	Radio-particulate	Selected subsets of existing RAAMP locations or, when line power becomes unavailable, substitute samplers powered by generators	RFETS AQM	For RAAMP samplers, continuous during subject projects if line power available; for generator-powered samplers, only during working hours of the subject projects. Weekly filter exchange, followed by gross alpha/beta counting and/or gamma spectroscopy; isotopic analyses as required	Assess radiological impacts of decommissioning and environmental restoration projects against environmental standards
Project	Beryllium	6 portable air samplers	RFETS AQM	During active demolition only; filter exchange and analysis determined on a project-specific basis	Assess beryllium impacts of selected decommissioning and environmental restoration projects against environmental benchmarks
Meteorology	NA	NREL M2 tower 1.2 miles north of former RFETS tower	NREL	Continuous	Monitor meteorological conditions for use in air quality modeling and for inputs to emergency response models

Table 3. Continued.

Type of Monitoring	Analyte	Locations	Performed By	Sampling Frequency	Purpose
CDPHE radio-particulate monitoring	Radio-particulate, alpha/beta activity	6 on-Site and perimeter continuous samplers; 4 to 6 close-in samplers (around selected projects)	CDPHE	Continuous	Detect and characterize Site-related radiological airborne emissions
Meteorology	NA	4, 10-meter towers at Site perimeter	CDPHE	Continuous	Provide data as needed for emergency response modeling

* Project monitoring for radionuclides uses designated subsets of the 25 RAAMP samplers as long as line power is available, with weekly filter exchanges. Redundant samplers that are not identified as compliance samplers or project monitoring samplers may be decommissioned as opportunity permits to support the Site closure mission.

Notes:

AQM = Air Quality Management
CDPHE = Colorado Department of Public Health and Environment
NA = Not applicable
NREL = National Renewable Energy Laboratory
RAAMP = Radioactive Ambient Air Monitoring Program
RFETS = Rocky Flats Environmental Technology Site

4.1.3 METEOROLOGICAL MONITORING

On-Site meteorological monitoring historically supported both the reporting requirements of Title 40 of the Code of Federal Regulations (CFR), Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities" (Rad-NESHAP) and the emergency response requirements of DOE Orders. Meteorological data are no longer measured on Site. However, representative meteorological data are collected by the National Renewable Energy Laboratory (NREL) at the M2 tower, located approximately 1 mile due north of the former RFETS meteorological tower. M2 tower data are queried by AQM staff at regular intervals. The change was necessary due to the decommissioning of the RFETS meteorological tower in FY04.

4.1.4 PROJECT MONITORING

Ambient monitoring for radionuclides and beryllium around selected building demolition and environmental restoration projects is performed by ESS. This monitoring effort characterizes the potential short-term impacts of emissions from such projects on ambient air quality and receptors closer to the projects than the RFETS perimeter. This scope differs from routine ambient monitoring because of shorter sampling periods, increased sampling frequency, closer proximity to potential source locations, and, in one case, a different AoI (i.e., beryllium). Additionally, while no regulatory standards apply specifically to this scope, the ambient concentration limits identified in the standards are used as guidance to establish action levels (regulatory compliance for radionuclides is determined using the routine ambient samplers at the RFETS perimeter: no beryllium standards currently apply to RFETS).

4.2 SITE AIR MONITORING SCOPE

Most ambient air monitoring and effluent monitoring performed at RFETS is done to satisfy the requirements of the Rad-NESHAP and DOE Orders. CDPHE and the ComRad Monitoring Program provide additional, independent air monitoring.

4.2.1 AMBIENT AIR

The Radioactive Ambient Air Monitoring Program (RAAMP) collects ambient radioparticulate air data. The RAAMP network comprises 25 size-partitioning, high-volume ambient air samplers. Fourteen of the 25 samplers are used to demonstrate compliance with Rad-NESHAP. Remaining samplers can be used for emission confirmation purposes should there be an accidental release from RFETS. Designated subsets of the RAAMP network are also used to determine localized impacts from decommissioning and environmental restoration (ER) projects, as described below. The existing RAAMP sampling network will provide the framework for this project monitoring program until line power resources become unavailable in the Site interior.

When line power becomes unavailable, substitute samplers having lower power demands or existing RAAMP samplers powered by generators for reduced sampling periods may be used[1].

[1] Substitute samplers will be chosen that have sufficient flow capacity to detect concentrations greater than 10% of the action level, at a minimum, over the prescribed sampling periods. If RAAMP samplers are operated on

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The RAAMP samplers run continuously, collecting airborne particles on pairs of sample substrates that segregate smaller inhalable particles from larger, more easily deposited airborne particulate matter. Filters and impactor substrates are routinely collected and submitted for analysis for specific isotopes of plutonium, uranium, and americium. The FY05 *IMP Background Document* details specific sampling intervals and analytical detection limits.

The CDPHE also operates air samplers within RFETS and at the perimeter of RFETS. The CDPHE-operated monitoring network serves to independently measure RFETS air quality conditions and public exposure to radioactive releases.

4.2.2 EFFLUENT AIR

Air emissions exhausted from buildings that could contain radioactive materials in sufficient quantity to have the potential to contribute at least 0.1 millirem (mrem) per year effective dose equivalent (EDE), uncontrolled, to any member of the public (significant sources) are monitored by continuous effluent sampling systems. This excludes those emission points undergoing active decommissioning that, as a result of decommissioning, can no longer provide representative effluent air samples. Filters are exchanged weekly and composited for analysis for selected plutonium, americium, and uranium isotopes. Historically, more than 50 locations within the Industrial Area were monitored; currently, one building release point is continuously sampled and this point is expected to enter active decommissioning during FY05. Sources having low emission potential (insignificant sources) are not monitored; radioparticulate emissions from insignificant sources are accounted for through the ambient monitoring network.

4.2.3 METEOROLOGICAL CONDITIONS

The former RFETS 61-meter tower, located in the northwest part of the Buffer Zone, was decommissioned in FY04. Continuous meteorological monitoring is conducted at the NREL M2 tower 1.2 miles north of the former Site meteorological tower location. Collected data comprise wind speed, wind direction, temperature, relative humidity (dew point), precipitation, and a calculated sigma-theta (used to determine Pasquill-Gifford stability classes). CDPHE also operates five 10-meter meteorological towers, located around the RFETS perimeter, that can provide data to support Site emergency response modeling.

4.3 PROJECT MONITORING—AIR

When a decommissioning project or ER project is planned that has the estimated potential to release radionuclides in sufficient amounts to contribute a 0.1 mrem dose to the most impacted public receptor, existing on-Site ambient air samplers are used to provide project monitoring for radionuclides so long as power to samplers remains available. Sampler substrates from selected RAAMP samplers that surround the affected project are exchanged weekly instead of monthly. Filters are screened through gross alpha/beta counting and/or gamma spectroscopy, and the results compared to predefined action levels. If necessary, results of the screening may be used by project personnel to adjust schedule or project controls to ensure Site-wide compliance with state and federal regulatory requirements and to confirm the effectiveness of as low as

generators, they will be operated only during the working hours of the subject project(s), which satisfies the detection limit for a 9-hour sample period.

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reasonably achievable (ALARA) principles. The filters and impactor substrates may also be analyzed for selected plutonium, americium, and uranium isotopes. As power to on-Site RAAMP samplers is decommissioned, alternative power sources or sampling resources will be employed to ensure that project monitoring can be accomplished as required.

The CDPHE may conduct independent project monitoring for radionuclides during selected demolition and remediation projects. Filters will be collected and analyzed for gross alpha activity. If necessary, results of the screening may be used by project personnel to adjust schedule or project controls to ensure Site-wide compliance with state and federal regulatory requirements, and to confirm the effectiveness of ALARA principles. The filters may also be analyzed for selected plutonium, americium, and uranium isotopes. These monitoring efforts shall include, but are not limited to, Building 776 demolition.

For beryllium monitoring purposes, a subject project will be ringed with six portable ambient air samplers that operate during periods of active demolition or remediation. Filters will be exchanged and shipped to off-Site laboratories for a total beryllium analysis, at a frequency set on a project-by-project basis. Results of beryllium analyses will be compared to ambient concentration benchmarks defined in the "National Emission Standard for Beryllium" (40 CFR 61, Subpart C). Although building demolitions are not subject sources pursuant to 40 CFR 61, Subpart C, the ambient air concentration standard listed therein was developed to be protective of human health and the environment, and therefore provides a reasonable basis for evaluating project monitoring results.

4.4 FUTURE RADIOLOGICAL AIR MONITORING

Soon after the completion of accelerated actions, expected sometime in early FY06, Kaiser-Hill will no longer perform the monitoring and reporting activities described in this IMP Background Document for DOE's Office of Environmental Management. At that time, a reduced monitoring scope will be performed by subcontractors under DOE LM, as described below.

After all demolition and remediation projects have been completed at RFETS, no buildings or other facilities will exist and no activities are anticipated that would have the potential to produce significant quantities of airborne radionuclide emissions, including fugitive dust emissions. The only potential sources of radionuclides at that time will be the low concentrations of residual contamination that remain in the surface soil as allowed under the closure agreement. Under these Site conditions, ambient air monitoring will be continued by DOE voluntarily for some period of time to confirm low emissions. Ambient monitoring will be performed at three existing locations. Two of these locations are situated along Indiana Street in the downwind direction under prevailing higher speed winds and in locations where typically highest potential dose has been estimated through modeling. The third location is situated west of the Site (along Highway 93), and will be used to compare predominantly upwind radionuclide air concentrations to concentrations at downwind locations.

Plutonium-239/240, americium-241, and uranium-233/234, -235, and -238 will be monitored monthly at three RAAMP samplers and rolling 12-month average dose will be calculated. If emissions of site-derived radionuclides are demonstrated to be significantly below 0.1 mrem per year for three consecutive years, radionuclide ambient air monitoring may be discontinued. This time frame was selected since continued recovery of vegetation on Site will further reduce dust emissions over time. Consequently, absent additional disturbances, highest emissions should

occur immediately following completion of accelerated actions and before full vegetative recovery. The results of the ambient radionuclide air monitoring will be reported annually to CDPHE and EPA.

5.0 ECOLOGICAL MONITORING

The Buffer Zone around the Industrial Area at RFETS is one of only a few areas along Colorado's Front Range that has remained largely undisturbed by encroaching development. The Buffer Zone contains several unique assemblages of animals and vegetation. Five major vegetation communities have been identified at RFETS:

- Xeric Tallgrass Prairie;
- Tall Upland Shrubland;
- Great Plains Riparian Woodland Complex;
- High Quality Wetlands; and
- Mesic Mixed Grassland.

Ecological monitoring is designed to provide information necessary for regulatory compliance and to manage and conserve the plant communities and wildlife in the Buffer Zone, including special-concern species (i.e., threatened, endangered, candidate, proposed, state-listed, or other sensitive species). The Preble's meadow jumping mouse (Preble's mouse) is of particular concern because it was listed as a threatened species on May 13, 1998. Ecological monitoring is also designed to provide information necessary to manage revegetated areas in the Buffer Zone and the Industrial Area.

Following physical completion, large portions of RFETS that are currently managed by DOE will be transitioned to US Fish and Wildlife Service (USFWS) management. DOE LM and USFWS are working on a Memorandum of Understanding (MOU) that will formalize aspects of the post-physical completion monitoring that will be performed. Monitoring covered by the evolving MOU will not be governed by the IMP.

5.1 MONITORING OBJECTIVES

The Ecological Monitoring Program (summarized in Table 4) is designed to provide data that can be used in management and conservation decision making. Monitoring has been categorized as regulatory compliance monitoring and Best Management Practice monitoring. Regulatory compliance monitoring is that required by permits, biological opinions, decision documents, or other statutes or rules. BMP monitoring is defined as monitoring not required by a regulatory driver, but important for making management decisions. It involves monitoring different variables in the plant communities or wildlife populations such that changes in these variables would trigger ecological protection and compliance decision making. Comparisons of monitoring data over time enable ecologists to detect changes, identify potential causes, and plan corrective actions for changes that result from RFETS activities, rather than from natural fluctuations.

Table 4. Ecological Monitoring Matrix

Basis for Monitoring	Number of Locations	Sampling Frequency	Purpose of Monitoring
Provide general information on significant wildlife species at RFETS.	Variable by year	Variable by survey type	Track changes in numbers, richness, and area use of significant wildlife species at RFETS.
Monitor noxious weeds at RFETS; comply with weed control regulations	Variable by year	In flowering season and as available for observation	Evaluate effectiveness of weed control actions, and aid in out-year planning for weed controls at RFETS.
Perform monitoring of selected revegetation areas	Variable by year	Annually	Evaluate effectiveness of revegetation efforts. Use information for management of areas.
Regulatory compliance mitigation monitoring	Variable by year (as specified in permits, biological opinions, decision documents)	Annually	Provide regulatory agencies with information on performance of mitigation success.
Monitor for the presence, or potential presence, of special-concern, threatened, or endangered plant and wildlife species and wetlands; comply with federal, state, and local protection and conservation regulations	Variable by year	As required	Ensure compliance of projects with applicable ecological regulations and protect rare, threatened, and endangered species from harm.

5.2 SCOPE OF MONITORING

Several types of monitoring have been conducted in the five vegetation communities, as well as monitoring some activities specific to one or more communities. The following activities are common to the five vegetation communities:

- Define the extant area of the community.
- Provide baseline estimates of the presence of birds and mammals, and estimate the baseline species richness of plant, bird, and mammal populations (plant species richness baseline will be determined from 1993–1996 or 1997 data, as applicable; the bird and mammal baseline was established in the *1996 Annual Wildlife Survey Report* (Kaiser-Hill, 1997).
- Identify rare or imperiled plant or animal species.
- Conduct weed mapping and photo surveys.

- Monitor the presence of noxious weeds and the effects of weed control efforts.
- Anticipate impacts from proposed RFETS projects, and estimate the potential area affected.
- Perform monitoring of selected revegetated areas after remediation activities.

Weed monitoring is conducted in areas beyond the five vegetation communities listed above.

5.2.1 *WETLANDS*

In addition to the activities listed above, the US Army Corps of Engineers and the EPA conduct periodic wetland characterizations. The EPA is the lead agency on wetlands for CERCLA project activities impacting wetlands. The US Army Corps of Engineers is the lead agency on wetlands for non-CERCLA project activities. The last characterization was completed in 1994.

5.2.2 *PROJECT-SPECIFIC MONITORING*

Proposed RFETS projects are evaluated in terms of potential effects on threatened and endangered (T&E) species, species of special concern (SSC), migratory birds, and wetlands. Additionally, monitoring will be conducted for the revegetation projects in accordance with the RFETS *Revegetation Plan* (Kaiser-Hill, 2004d). Much of the data for such evaluations comes from the monitoring activities listed above and previously collected baseline information, but additional data needs may be identified to assess the impact of such projects in specific areas. Project-specific data needs may include:

- Seasonal presence or absence of affected species, and the seasonal timing of the proposed project;
- Presence of habitat considered suitable for T&E and SSC species;
- Biological characteristics of species of concern (e.g., feeding and nesting habits, home range, habitat preference), and potential effects of the proposed project; and
- Revegetation location monitoring data.

Projects are also evaluated in terms of their impacts to migratory birds and RFETS wetlands. Wetlands include both those areas mapped by the US Army Corps of Engineers and those areas not included on the map.

Table 5 lists several planned 2005 projects that may potentially impact wetlands or Preble's mouse habitat.

Certain project activities may require a biological assessment or biological opinion, or a wetland mitigation plan. These plans may include monitoring activities for specified objectives over time. The DQOs for each activity are indicated in the project-specific biological assessment or opinion, or mitigation plan.

Numerous locations at RFETS have been or will be revegetated in accordance with the Site's *Revegetation Plan* (Kaiser-Hill, 2004d). The plan provides guidance for revegetation activities, including prescribed seed mixes, seeding time frames, monitoring requirements, and success criteria.

Table 5. Planned 2005 Projects with Potential to Impact Wetlands or Preble's Mouse Habitat.

Project	Status of Project	Summary of Monitoring Requirements
Original Landfill (W,P)	Scheduled 2005	Pending
Present Landfill (W)	Ongoing	Began in 2003
East Firing Range(W,P)	Complete	Began in 2003
903 Pad and Lip Area (W)	Ongoing	Began in 2003
Well Abandonment and Removal Program (W,P)	Ongoing	None
Pond Remediation Activities (W,P)	Ongoing	Began in 2003
Groundwater Plume	Scheduled 2005	
A & B Pond Series Dam Notching	Scheduled 2005	
C-1 Pond Dam Notching	Completed	Began in 2004
General Industrial Area Revegetation (W,P)	Ongoing	Began in 2003

Notes:
W indicates potential wetland impacts.
P indicates potential Preble's impacts.

5.3 OUTSIDE FACTORS AFFECTING RFETS ECOLOGY

The ecological resources at RFETS are influenced not only by Site activities but also by issues and activities that occur off Site. Outside factors that may affect ecological resources at RFETS include, for example, noxious weeds, chronic wasting disease, West Nile virus, plague, and other zoonoses. These and other factors often affect the surrounding region, which must be considered when evaluating the ecology of the Site.

For example, the Colorado Division of Wildlife killed and tested a portion of the existing deer population for chronic wasting disease in late FY02. If chronic wasting disease had been found, it may have been necessary to destroy the entire population.

Activities on adjacent properties may also impact Site vegetative communities and habitats. The Site borders lands used for various activities, including grazing, mining, and open space. While the Site continues to implement a comprehensive integrated vegetation management program, the Site is influenced by the activities on neighboring lands that are beyond the control of Site personnel. Wind-blown materials (i.e., noxious weeds) from lands can readily cross property lines, as can prairie dogs. Climate changes have the potential to affect the plant communities as do weed control efforts or the lack thereof, on lands surrounding RFETS. Sociological and political factors have the potential to affect the ecology at RFETS. For example, social or political pressures that restrict the use of grazing or prescribed fire on the grasslands will affect the long-term sustainability of the prairies at RFETS.

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5.4 DATA MANAGEMENT

Ecological data were historically stored in two databases, the Ecological Monitoring Program Database and the Sitewide Ecological Database. Because extracting data for specific purposes requires a high degree of system-specific knowledge, the two databases were combined. The new database, the Site Ecological Database, allows for multi-user access (with security restrictions) for Site personnel. This database contains data from the early 1990s through the end of 2001. Since 2002, data are available in separate databases for each monitoring study.

5.5 REPORTING

The Ecological Monitoring Program has produced an annual ecology report for the Site since the mid-1990s. The final annual ecology report produced by Kaiser-Hill will be prepared in 2005 to summarize and report the data collected in 2004. The Ecological Monitoring Program also provides the reports required for regulatory compliance as directed by permits, biological opinions, and RFCA decision documents. Future reporting efforts will be determined by DOE. The *2004 and 2005 Vegetation Management Plan for the Rocky Flats Environmental Technology Site* (Kaiser-Hill, 2004e) was issued in 2004 to address planned weed control and other management efforts through closure.

6.0 REFERENCES

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Kaiser-Hill, 2004c. *2003 Annual RFCA Groundwater Monitoring Report*. Golden, Colorado. December.

Kaiser-Hill, 2004d. *Revegetation Plan*. Golden, Colorado. January.

Kaiser-Hill, 2004e. *2004 and 2005 Vegetation Management Plan for the Rocky Flats Environmental Technology Site*. Golden, Colorado. April.

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Upon DOE acceptance of Physical Completion, DOE's Office of Legacy Management (LM) will assume responsibility of all long-term surveillance and maintenance of the Site including the environmental monitoring. The activities of LM, including site inspections, operations and maintenance, and environmental and institutional control monitoring, will be described in a Long-Term Surveillance and Maintenance Plan (LTS&M Plan). The LTS&M Plan is currently being prepared for your review, will incorporate large portions of the FY05 IMP, and, upon approval, will supercede the FY05 IMP.

The LM will introduce this approach to stakeholders beginning with the Closure Transition Meeting in June.

If you have any questions concerning this transmittal, please contact John Stover at (303) 966-9386.

Sincerely,

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Enclosure

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